Connect Globally | Make Locally: Cases in Design-Through-Production Collaboration Between the Academy and Industry

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ABSTRACT

Collaboration and information exchange are the primary tactics for a globally connected locally produced design-through-production process. With strategic industry partners, Ball State University students test knowledge through real-world applications. While the open access to knowledge in the global environment is critical, it is also imperative to consider the ethic of production and regionally specific conditions under which work is enabled. To this end, the paper will reveal specific design-through-production industry-partner collaborations, while exploring the regional implications of making locally, and consider the role of the university to serve as a local catalyst for change in a shifting global economic climate.

KEYWORDS: digital fabrication, immersive learning, regionalism, collaborative design, design-through-production.

The world is interconnected with ideas transferring across distant regions in real-time. In the realm of immediate temporal connectivity, a new ethic has emerged—an ethic that privileges open source sharing of information and collaboration. The thing that binds us together is the space of ideas, rather than the space of physicality. As researchers in the arts and architecture, our responsibility in this global social realm is critical, yet our formulations do not always examine their broader impact. "Even though scientists have the most to do with technological imagination as invention, they generally feel very little responsibility to participate in the technological imagination as part of a larger social imagination" (White, 2003, 121).

We live in real places, and are affected by encounters we have in real spaces. We still share a human collective desire to be some*where*. Local and regional culture adds distinctiveness, no matter where we live. While "the Americas" are interconnected more than ever (with apologies for privileging "America" in the citations as referring to the "United States"), we have distinct regional characteristics, which add great value to our global exchange. The technological society has afforded a completely new sense of relation to the world, and yet as we fashion the environments around us, we must be cognizant that the specificity under which we exchange ideas is of great worth, and worthy of our scholarly attention.

This moment in the world has engendered a shift in production (physical and cultural) nearly as big as the industrial revolution, and quite possibly even the shift from the late Medieval to the Renaissance. This shift is being led by the technological capacity of information. The only thing uncertain is patronage. Who are the Medici in this globally-connected/locally-affected condition?

Certainly, the technologist continues to be critical in the conversation—just as Mies speculated that one day technology and architecture would be manifestations of one another (Van der Rohe, 1950). But, I would argue that now more than ever, the humanist position is growing more central to the discourse as we fashion complex, interrelated, multidisciplinary solutions to the problems we engage, and we restructure how we design for contemporary conditions. William Mitchell sums up clearly:

> *One of the huge problems with design has been the way that the lines get broken up into these traditionally defined disciplines... The big important design issues just don't fall in these categories anymore. They sprawl in messy ways across them. We [at MIT] have architects, urban designers, economists, mechanical engineers, electrical geeks, and we put them together into an intense multidisciplinary design environment... it's everyone's responsibility to contribute to everything and educate the rest of the group as necessary on the issues that you know the most about. (Mitchell, Makovsky 2010, 52).*

Economic Realities, Innovation, and Culture of Making in the Middle

The Midwest of the United States has been a productive center of manufacturing over the last decade. We make things in the middle and this has defined the culture of the Midwest for over a century. "Half of everything made in America was made in the Midwest" (Longworth, 2008, 26). "The Midwest reigned as the Silicon Valley of the industrial era. Innovation flew from fertile imaginations and invented a new economy" (Longworth, 2008, 26). At the turn of the last century, there were 170 automobile manufacturers in Indiana. Indiana was Detroit before Detroit. It is no mistake that the Indianapolis 500 became "the greatest spectacle in racing," pushing speed, performance, and innovation out of these production realities. Other industries have flourished here as well. Industrial glass flourished from the gas boom surrounding Muncie, "Hoosier Cabinets," organized all baking goods into one piece of furniture, and transformed the modern kitchen coming from many of the small communities surrounding Indiana (still today, even given global competition, Indiana is one of the top states for production in the US in the custom cabinetry industry). Other manufacturing is still around, although not nearly as productive: RV and manufactured housing industries, limestone and hardwood production, steel and other metal production and fabrication. Yet, the primary struggle with our regional industry locked into old business models is that we cannot be competitive in a world where labor costs are much lower elsewhere. To that end, the only strategy to remain competitive is based on advanced manufacturing techniques, shifting the deployment of labor into tooled-up, information driven skill sets—or put another way, to touch two of the "three T's" as articulated by Richard Florida as being central to economic development: "Technology, Talent, and Tolerance" (Florida, 2002, 249). "If the Midwest's future contains manufacturing, it will be high-end, high-tech manufacturing, demanding two-year degrees at least." (Longworth, 2008, 173). In a way, this is the opposite of what happened during the final push of the industrial revolution noted in the great sociological treatise conducted in Muncie, Indiana entitled: "Middletown:" "Inventions and technology continue rapidly to supplant muscle and the cunning hand of the master craftsman by batteries of tireless iron men doing narrowly specialized things over and over..." (Lynd, 1929, 39). Those days in the Midwest are long gone.

Immersive Learning and the Role of a State Sponsored University

> *Let art out of the museum and out of the university. Deinstitutionalize it. Take off the straightjacket of philanthropic support.*
>
> *(White, 2003, 20-21)*

Academic institutions are confronted with the challenge of their relevance to the region given new global realities. "The Heartland's growing educational deficits will continue to be one of the most serious roadblocks for the region if it is to take advantage of the coming opportunities in the globalized marketplace." (Carr, 2009, 148). Recently, an enormous amount of attention has been paid in the Midwest to rethinking community colleges in an effort to retool the workforce with new skills that are relevant to a new form of production in globally competitive markets. "Rather than fighting globalization, the Heartland must come to terms with the new reality." (Carr, 2009, p.145). But community colleges are not enough. "Longworth advocates the development of a regional identity and Midwestern think-tanks that will generate new ideas and a focus on issues common to the region. He also calls for a wholesale renovation of education and training..." (Carr, 2009, 14.). The dilemma for state schools is how to help retool the workforce, while providing the necessary diversity of knowledge and collaboration skills outlined above by William Mitchell—in essence, how to affect the Midwestern economy, while maintaining the breadth, type, and scope of research.

At Ball State University, we believe that new methods of education engaging industry directly are central to rethinking how we operate regionally in global conditions. As a state educational institution, we are bound to serve the state that supports our existence. But, we also must be open to act regionally, and share those ideas and responsibilities with nearby states, which, due to funding realities, typically act as totally separate institutions. "No real future exists except the future that the Midwest creates for itself. That future must be crafted regionally, by the Midwest acting as a single unit, not as a mélange of hostile states but as one region that shares not only a past but a future (Longworth, 2008, 245).

At Ball State University, we have a commitment to two topic areas: *immersive learning*, and *emerging media*, in other words, to cultivate information technology and engage industry directly. *Immersive learning* aims to intersect classroom activity with real world partnerships. *Emerging media*, explores the latest technology in order to prepare students for our information-driven world. In the College of Architecture and Planning, we have created our projects as design exercises that simultaneously ramp up digital technological skill sets while working with local industry partners. We believe that this formula is critical for making a regional impact.

Ball State University, College of Architecture and Planning and the Certificate in Digital Design and Fabrication

At Ball State University, students have the opportunity to explore a design-through-production methodology. The projects, ReBARN, Titanium Pedestrian Bridge, and Indianapolis 500 Hall of Fame Museum resulted from *immersive learning*

courses central to our new four-course graduate certificate program in Digital Design and Fabrication.

With strategic industry partners and the support of the Institute for Digital Fabrication students test knowledge by dealing with the translation of bits into atoms, shifting scales between models, prototypes, 1:1 construction, and the development of solutions to real problems by managing a complex set of design constraints. This pedagogical method always promotes team-based design groups over sole authorship within courses as a more realistic preparation for students about to enter the profession. Information exchange is central to the realization of team objectives. Furthermore, communication and information-sharing skills are essential to keep the collaborative process productive as projects evolve by effectively managing feedback and the global exchange of ideas.

Case in Design through Production: Titanium Bridge

A digital design and fabrication seminar took on the challenge to develop entries for the Titanium Pedestrian Bridge Competition entitled "Design the Future." Our interest in this program was two-fold, it was a real project located in the Midwest (Akron, OH), and it was sponsored by the Defense Metals Technology Center whose agenda was to find more civilian uses for titanium technology. In their promotional literature, they called the Midwest: the "Metals Heartland." The competition brief states: "Where better to find skilled competitors than from Civil Engineering, Architecture, and Industrial Design departments and schools of qualified universities in the Metals Heartland of America..." This kind of informed client certainly contributes to making the case in building bridges towards a Midwestern regional identity (Fig. 1).

Figure 1. Titanium Bridge: Ball State Scheme using 100% titanium

Case in Design through Production: Indianapolis 500 Hall of Fame Museum

In a joint design studio with Professor Mahesh Senagala, students aligned in the first half of the semester into "innovation garages," or collaborative teams aimed at brainstorming innovation. The second half of the semester they organized in partnership with the Indianapolis Motor Speedway and proposed an addition to the outdated Indianapolis 500 Hall of Fame Museum (Fig. 2). The goal of the project was to deploy innovative design methodologies and fabrication techniques for a cultural institution that resonates so deeply with the Midwest's culture for production: Indiana is the home of innovation in the automotive industry. In 1852 in Kokomo, Indiana, Elwood Haynes invented one of the first successful gasoline-powered automobiles. For 100 years, the "Indy 500" has been the international proving ground for innovations in automobile technology since the invention of the motor-car.

Case in Design through Production: ReBarn

A digital design and fabrication seminar partnered with regional metal fabrication experts at Zahner Architectural Metals in Kansas City, and developed a strategy to repurpose barn siding (275 unique pieces for a total of 300,000 board feet) from a 100 year old "Pennsylvania style" barn located near Muncie, Indiana (Figs. 3 and 4). The project, developed in partnership with the mayor and local parks commission, enhances a public park along the White River in Muncie. Students and Zahner discussed this project very early in the design-through-

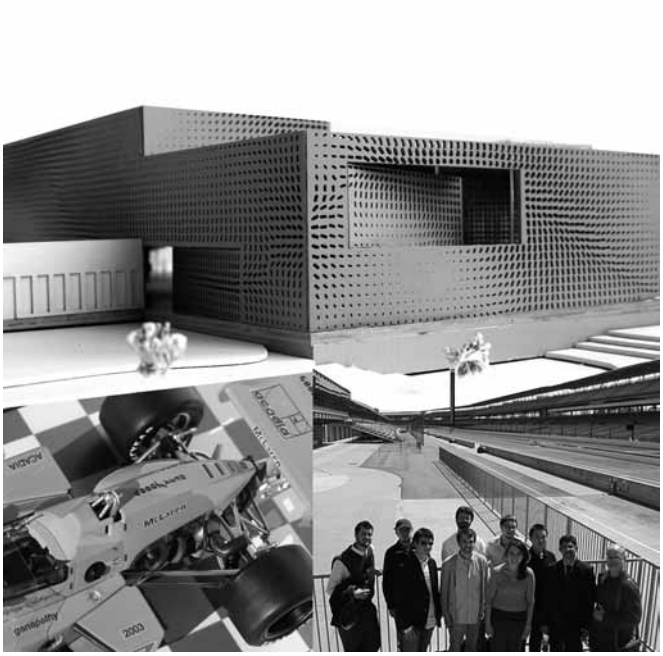

Figure 2. Indianapolis 500 proposal, content, and team: speed + performance

Figure 3. ReBarn: A second life for repurposed barn siding

Figure 4. ReBarn: assembly and occupation (Zahner Metals tooled aluminum and barn siding)

production process in order to effectively design and engineer and fabricate reBarn. This collaboration included exchanging information online, and a meeting at Zahner's office in Kansas City, and led to five water jet cut aluminum surface panels and over 350 variable aluminum joints. Each reclaimed wood component was custom milled using a 3-axis CNC router. The digital design and fabrication technologies along with industry partnerships were instrumental in realizing the project.

Conclusions

This design-through-production approach to projects can be applied to any region working with particular local conditions and sharing knowledge globally. The above *immersive learning* projects rely heavily on interdisciplinary, applied design and fabrication research, and the evolution of expertise with state-of -the-art software and devices using simulation, analysis, fabrication, and a rigorous examination of the craft inherent in digital design and production. Students connect to the global stream of information about digital design techniques, and work with consultants invited to add specific value to the feedback loop. Industry partners from the local manufacturing sector are integral participants around the virtual table as students formulate their strategies. In the design-through-production methodology, information about final production constraints is essential to initial design approaches. As such, bringing industry partners into the collaborative early adds tangible and practical value to the design process from the outset and makes a demonstrable contribution to affecting regional industry, both in methodology and in production.

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